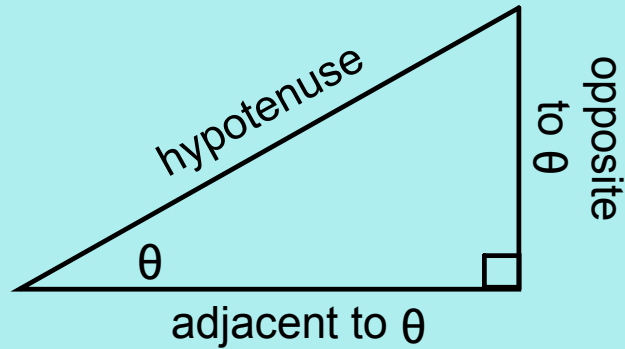


For any angle of interest, there are three (3) primary trigonometric ratios.

$$\text{sine of } \theta = \frac{\text{opposite}}{\text{hypotenuse}}$$

$$\text{cosine of } \theta = \frac{\text{adjacent}}{\text{hypotenuse}}$$

$$\text{tangent of } \theta = \frac{\text{opposite}}{\text{adjacent}}$$



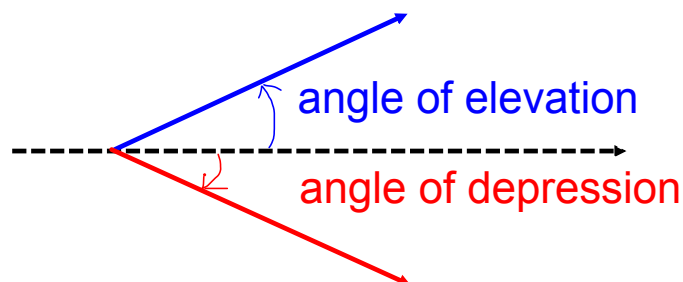
S o h C a h T o a

L5(7.6) - Solving Problems with Trigonometric Ratios

Terminology:

Angle of Elevation (or Inclination): the angle measured above the horizontal.

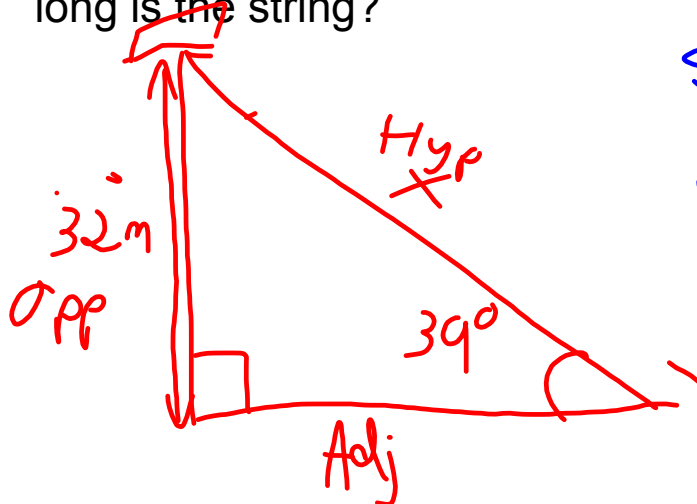
Angle of Depression (or Declination): the angle measured below the horizontal.



Steps:

- 1) Identify the unknown (what are you looking for?)
- 2) Label the sides of the triangle as opposite, hypotenuse, and adjacent with respect to the given angle (or the unknown if angle is what you are looking for)
- 3) Identify the trigonometric ratio that relates to the unknown and two of the unknowns OR Pythagorean Theorem OR the sum of the angles in a triangle.
- 4) Solve

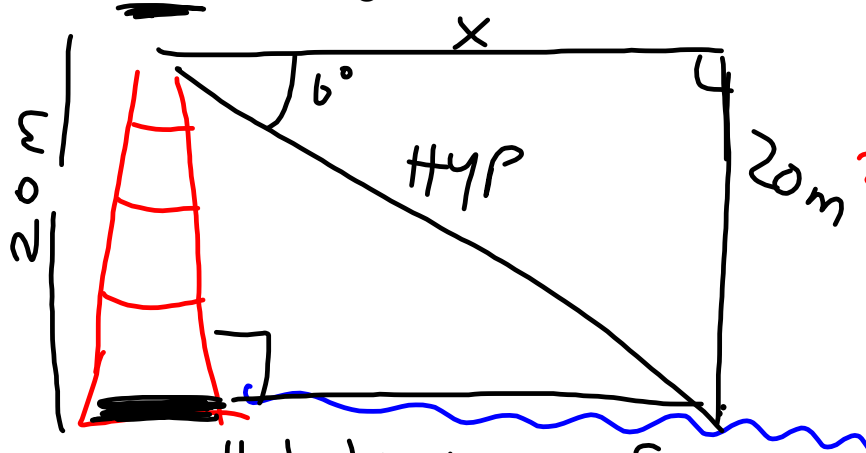
Ex.1 A kite is 32 m above the ground. The string makes an angle of 39° with the ground. How long is the string?



$$\begin{aligned}\sin \theta &= \frac{O}{H} \\ \sin 39^\circ &= \frac{32}{X} \\ X &= \frac{32}{\sin 39^\circ} \\ X &= 50.8\end{aligned}$$

Therefore the string is 50.8 m long.

Ex.2 A lighthouse observation deck is about 20 m above sea level. A boat is viewed at an *angle of depression* of 6° . How far is the boat from the base of the lighthouse?



\therefore the boat is 190.3 m from the base of the lighthouse.

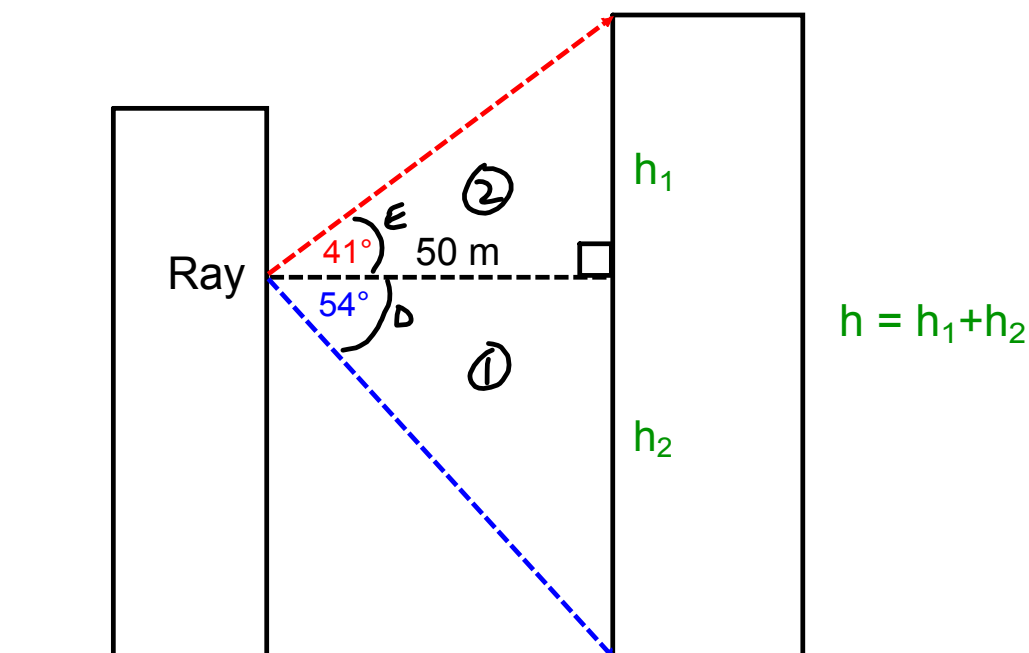
$$\tan 6^\circ = \frac{20}{x}$$

$$20 \cdot \frac{1}{\tan 6^\circ} = \frac{x}{20}$$

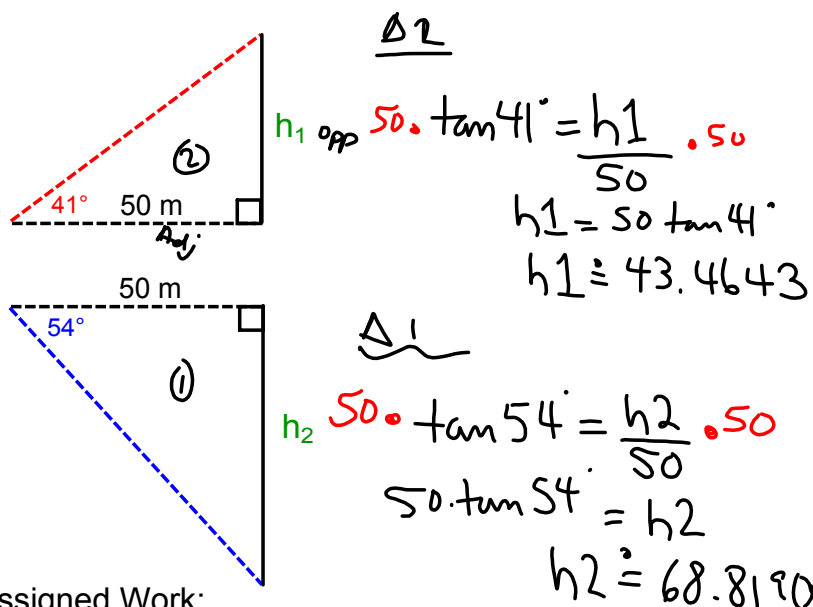
$$\frac{20}{\tan 6^\circ} = x$$

$$x = 190.3$$

Ex.3 From the window of a building, Ray finds the angle of elevation to the top of a second building to be 41° . The angle of depression to the bottom is 54° . The buildings are 50 m apart. How tall is the second building?



Solve one triangle for h_1 and the other triangle for h_2



Assigned Work:
p.412 # 2, 3, 7, 10

Total height = $h_1 + h_2$
 \therefore the height of the building is $43.4643 + 68.8190$
 ≈ 112.28

